IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	)	Examiner: An, Shawn S.
Liu, et al.	)	Art Unit: 2613
Application No. 10/015,040	)	
Filed: December 11, 2001	)	
For: SCENE CHANGE DETECTION	)	

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

This is an appeal to the Board of Patent Appeals and Interferences from the decision of the Examiner of Group 2613, dated March 31, 2005 in which claims 1-5, 7, 9, 10, 12-19, 21, 22, 24, 26-28 and 30-32 were finally rejected in the above-identified application. This Appeal Brief is hereby submitted pursuant to 37 C.F.R. § 41.37(a).

I. REAL PARTY IN INTEREST

The real parties in interest are the assignees of the full interest in the invention, Sony Corporation, Tokyo Japan and Sony Electronics Inc., Park Ridge New Jersey.

II. RELATED APPEALS AND INTERFERENCES

To the best of Appellant's knowledge, there are no appeals or interferences related to the present appeal that will directly affect, be directly affected by, or have a bearing on the Board's decision in the instant appeal.

III. STATUS OF THE CLAIMS

Claims 1-32 are pending in the application and claims 1-5, 7, 9, 10, 12-19, 21, 22, 24, 26-28 and 30-32 were finally rejected in an Office Action mailed March 31, 2005. Claims 1-5, 7, 9, 10, 12-19, 21, 22, 24, 26-28 and 30-32 are the subject of this appeal. A copy of pending claims as they stand on appeal are set forth in Appendix A.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been made after receipt of the Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Appellant's invention as claimed in claims 1-5, 7, 9, 10, 12-19, 21, 22, 24, 26-28 and 30-32 analyzes the motion vectors in a sequence of three video frames to detect any scene change in the sequence. If a scene change is detected, the first frame is encoded as a different frame, e.g., an I-frame is encoded as a P-frame. [Figure 17A, paragraphs 92-98] The analysis creates two sets of motion vectors. The first set is derived from the first and second video frames; the second set is derived from the third video frame. A ratio between the first and second sets is compared with a threshold to determine if a scene change has occurred. [Figure 22e, paragraphs 151-153] In one embodiment, the magnitude of motion vectors are also compared against a second threshold to detect a scene change [Figures 23-24 and paragraphs 153-155].

The first and second sets of motion vectors may comprise two subsets of motion vectors derived from fields of same polarity in two frames. The first and second subsets of the first set of motion vectors are derived from the first and second fields in the first and second frames. The first and second subsets of the second set motion vectors may be derived from the first and second fields in the first and second frames, or may be derived from the first and second fields in the first and third frames. [Figures 22a-d, paragraphs 141-150]

Claims 30-32 are means-plus-function claims. Referring to Figure 3B, a corresponding structure for the means for receiving is block 356, and corresponding structures for the means for comparing reside within block 360. Descriptions of blocks

356 and 360 are found at paragraphs 58-60. Each means for comparing incorporates the data flow structure illustrated in blocks 2402 and 2404 of Figure 24 and described at paragraph 155.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

I. Claims 1-3, 14-17, 26 and 30-32 stand rejected under 35 U.S.C. § 35 U.S.C. § 103(a) over U.S. Patent 6,735,253 to Chang et al. and U.S. Patent 5,682,204 to Uz et al.

II. Claims 4-5, 7, 9-10, 12, 18-19, 21-22, 24 and 27-28 stand rejected under 35 U.S.C. § 103(a) over Chang and Uz in view of U.S. Patent 6,108, 039 to Linzer et al.

VII. ARGUMENTS

I. Claims 1-3, 14-17, 26 and 30-32 are Patentable under 35 U.S.C. § 35 U.S.C. § 103(a) over Chang and Uz.

Chang discloses the detection of scene changes in a encoded video bitstream without having to convert the bitstream back into the original video. Chang uses three ratios to determine if a scene change has occurred within the corresponding frames: 1) the number of intracoded macroblocks to the number of forward motion vectors, 2) the number of backward motion vectors to the number forward motion vectors, and 3) the number of forward motion vectors to the number of backward motion vectors. When a scene change is detected, a P or B frame in the encoded digital bit stream may be converted to an I frame.

Uz discloses different encoding "bit budgets" for I, P and B frames in a video sequence. The budgets are updated as the video sequence is processed until a scene change is detected. Upon detecting a scene change, the budgets for the I, P and B frames are reset to their respective frame type default values.

A. Claims 1-3, 14, 16-17, 26 and 30-31

Claims 1-3, 14, 16-17, 26 and 30-31 stand or fall together. Claim 1 is the representative claim.

The Examiner asserts that Chang discloses all of the elements of Appellant's claim 1, except for the encoding a first frame to a different type of frame when a scene change is detected. The Examiner is relying on Uz as disclosing this element.

The Examiner is equating Chang's ratios to Appellant's claimed ratio of the first and second set of motion vectors. However, Chang does not disclose a ratio based on the motion vectors themselves. Instead, Chang's ratios are based on the *number of* motion vectors. Accordingly Chang cannot be properly interpreted as disclosing Appellant's claimed ratios.

Furthermore, Uz does not disclose changing the type of the first frame after a scene change as claimed by Appellant. Instead, Uz changes the encoding budget for the frame type from its current value to the default value *for the same type of frame.*

Accordingly, the combination of Chang and Uz cannot render obvious Appellant's invention as claimed in claims 1-3, 14, 16-17, 26 and 30-31.

B. Claims 15 and 32

Claims 15 and 32 and stand or fall together. Claim 15 is the representative claim and depends from claim 14.

The Examiner asserts that Chang discloses changing an I-frame to a P-frame. However, a thorough reading of Chang reveals that the I-frame is NOT converted. Instead, a duplicate P frame is created and inserted into the bitstream.

> In step 1020, the frame is examined in order to determine whether it is an I, P or B frame. If the frame is not an I frame 1021, it is converted into an I frame 1030. Finally, original 1022 or converted 1030 I frames are then used [as] to create duplicate P frames 1040. [Chang: col. 13, line 64 through col. 14, line 1]

Figure 11 of Chang illustrates the results of the recited steps. Note that the original I frame (I_0) continues to appear in the stream after the duplicate P frames have been added. In addition, Figure 7 shows frames to be converted to another type in italics, and none of the I frames are italicized. Therefore, the Examiner's interpretation of Chang in incorrect.

Accordingly, the combination of Chang and Uz cannot render obvious Appellant's invention as claimed in claims 15 and 32.

II. Claims 4-5, 7, 9-10, 12, 18-19, 21-22, 24 and 27-28 stand rejected under 35 U.S.C. § 103(a) over Chang and Uz in view of U.S. Patent 6,108, 039 to Linzer et al.

Linzer discloses predicting motion vectors for frames of video. Linzer compares fields of the same, and fields of opposite, polarity in two pairs of frames to select a estimated motion vectors for the top and bottom fields of each frame. Linzer contains no disclosure related to scene detection.

A. Claims 4, 9, 18, 21 and 27

Claims 4, 9, 18, 21 and 27 stand or fall together. Claim 4 is the representative claim and depends from claim 1.

Linzer does not teach or suggest comparing a ratio of the first and second sets of motion vectors to a threshold as claimed in claim 1. Furthermore, Linzer does not teach or suggest changing a first frame to a different type if a scene change is detected. Because the combination of Chang and Uz also do not disclose these elements in claim 1, the combination of Chang, Uz and Linzer cannot be properly interpreted as teaching or suggesting the invention claimed in claim 4.

Accordingly, the combination of Chang, Uz and Linzer cannot render obvious Appellant's invention as claimed in claims 4, 9, 18, 21 and 27.

B. Claims 5, 7, 10, 12, 19, 22, 24 and 28

Claims 5, 7, 10, 12, 19, 22, 24 and 28 stand or fall together. Claim 5 is the representative claim.

The Examiner asserts that it would be obvious to modify Chang to compare ratios of field motion vectors instead of ratios of frame motion vectors in rejecting claim 5 over the combination of Chang, Uz and Linzer. However, Chang does not disclose ratios of frame motion vectors, as Appellant stated above, and so cannot serve as a basis for the Examiner's proposed modification. Furthermore, the Examiner supports his modification by stating that it well known that a frame comprises two fields. The Examiner provides no evidence from any of the cited references, or from the art as a whole, that would suggest any advantage in making the proposed modification. Just the fact that the modification is within the ordinary skill in the art is insufficient to establish a proper *prima facie* case of obviousness.

Accordingly, the combination of Chang, Uz and Linzer cannot render obvious Appellant's invention as claimed in claims 5, 7, 10, 12, 19, 22, 24 and 28.

VIII. CONCLUSION

Claims 1-3, 14-17, 26 and 30-32 are not rendered obvious by the combination of Chang and Uz. Claims 4-5, 7, 9-10, 12, 18-19, 21-22, 24 and 27-28 are not rendered obvious by the combination of Chang, Uz and Linzer. Accordingly, Appellant respectfully requests the Board reverse the rejections of claims 1-5, 7, 9, 10, 12-19, 21, 22, 24, 26-28 and 30-32 under 35 U.S.C. § 103 and direct the Examiner to enter a Notice of Allowance for claims 1-32.

Fee for Filing a Brief in Support of Appeal

Enclosed is a check in the amount of $ 500.00 to cover the fee for filing a brief in support of an appeal as required under 37 C.F.R. §§ 1.17(c) and 41.37(a).

Deposit Account Authorization

Authorization is hereby given to charge our Deposit Account No. 02-2666 for any charges that may be due. Furthermore, if an extension is required, then Appellant hereby requests such extension.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR
& ZAFMAN LLP

Dated: September 30, 2005

Sheryl Sue Holloway
Attorney for Applicant
Registration No. 37,850

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, CA 90025-1026
(408) 720-8300 x309

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APPENDIX A FOR

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

1. (Previously amended) A method for determining a scene change in a video sequence during encoding of the video sequence, the method comprising:

receiving a first video frame, a second video frame and a third video frame;

determining a first set of motion vectors between the first video frame and the second video frame and a second set of motion vectors using the third video frame; and

comparing a ratio of the first and second sets of motion vectors to a first threshold to determine whether a scene change has occurred, the occurrence of a scene change causing the first frame to be encoded as a different type of frame.

2. (Original) The method of claim 1 wherein the first video frame precedes the second video frame and the second video frame precedes the third video frame.

3. (Original) The method of claim 1 wherein the third video frame precedes the first and second video frames and the second video frame precedes the first video frame.

4. (Original) The method of claim 1, wherein:

the first video frame comprises a first and second field;

the second video frame comprises a first and second field; and

the third video frame comprises a first and second field.

the first set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the second video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the second video frame; and

the second set of motion vectors comprises a first subset of motion vectors between the first field of the second video frame and the first field of the third video frame and a second subset of motion vectors between the second field of the second video frame and the second field of the third video frame.

5. (Original) The method of claim 4, wherein comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and the first subset of the second set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the first set of motion vectors and the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold.

6. (Original) The method of claim 4, wherein comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and the first subset of the second set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the first set of motion vectors and the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold and the sum of

the magnitudes of members of the first subset of the first set of motion vectors is greater than a second threshold.

7. (Original) The method of claim 4, wherein if second frame is a P-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold.

8. (Original) The method of claim 4, wherein if the second frame is a P-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold and the sum of the magnitudes of members of the first subset of the second set of motion vectors is greater than a second threshold.

9. (Original) The method of claim 1, wherein:

the first video frame comprises a first and second field;

the second video frame comprises a first and second field; and

the third video frame comprises a first and second field.

the first set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the second video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the second video frame; and

the second set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the third video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the third video frame.

10. (Original) The method of claim 9, wherein if the first frame is an I-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and a sum of the first subset of the first set of motion vectors minus the second subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the first subset of the second set of motion vectors and the sum of the first subset of the second set of motion vectors minus the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold.

11. (Original) The method of claim 9, wherein if the first frame is an I-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and the sum of the first subset of the first set of motion vectors minus the second subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the first subset of the second set of motion vectors and the sum of the first subset of the second set of motion vectors minus the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first and second video frame if the first and second ratios are larger than the first threshold and if the sum of magnitudes of members of the first subset of the first set of motion vectors is greater than a second threshold.

12. (Previously amended) The method of claim 9, wherein if the second frame is a B-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold.

13. (Previously amended) The method of claim 9, wherein if the second frame is a B-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold and if a sum of members of the first subset of the second set of motion vectors is larger than a second threshold.

14. (Previously amended) The method of claim 1, wherein if a scene change is detected further comprising:

beginning a new group of pictures (GOP) at a point after the scene change.

15. (Original) The method of claim 14, wherein if a scene change occurs at a frame following an I-frame further comprising converting the I-frame to a P-frame and converting a following P-frame to an I-frame.

16. (Original) The method of claim 1, wherein the threshold is a heuristically determined value.

17. (Previously amended) A video device to encode a video sequence comprising:

an input configured to receive a first video frame, a second video frame, and a third video frame; and

a processor configured to determine a first set of motion vectors between the first video frame and the second video frame and a second set of motion vectors using the third video frame and compare a ratio of the first and second sets of motion vectors to a first threshold to determine whether a scene change has occurred, the occurrence of a scene change causing the first frame to be encoded as a different type of frame.

18. (Original) The video device of claim 17, wherein:

the first video frame comprises a first and second field;

the second video frame comprises a first and second field; and

the third video frame comprises a first and second field.

the first set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the second video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the second video frame; and

the second set of motion vectors comprises a first subset of motion vectors between the first field of the second video frame and the first field of the third video frame and a second subset of motion vectors between the second field of the second video frame and the second field of the third video frame.

19. (Original) The video device of claim 18 wherein if second frame is a P-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold.

20. (Original) The video device of claim 18, wherein if the second frame is a P-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the second set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the second subset of the first set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold and the sum of the magnitudes of members of the first subset of the second set of motion vectors is greater than a second threshold.

21. (Previously amended) The video device of claim 17, wherein:

the first video frame comprises a first and second field;

the second video frame comprises a first and second field; and

the third video frame comprises a first and second field.

the first set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the second video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the second video frame; and

the second set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the third video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the third video frame.

22. (Original) The video device of claim 17, wherein if the first frame is an I-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and a sum of the first subset of the first set of motion vectors minus the second subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the first subset of the second set of motion vectors and the sum of the first subset of the second set of motion vectors minus the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold.

23. (Original) The video device of claim 17, wherein if the first frame is an I-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and the sum of the first subset of the first set of motion vectors minus the second subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the first subset of the second set of motion vectors and the sum of the first subset of the second set of motion vectors minus the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first and second video frame if the first and second ratios are larger than the first threshold and if the sum of magnitudes of members of the first subset of the first set of motion vectors is greater than a second threshold.

24. (Original) The video device of claim 17, wherein if the first frame is a B-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the second subset of the first set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the first subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold.

25. (Original) The video device of claim 17, wherein if the first frame is a B-frame comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the second subset of the first set of motion vectors and the first subset of the first set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the second set of motion vectors and the first subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the second video frame and third video frame if the first and second ratios are larger than the first threshold and if a sum of members of the second subset of the first set of motion vectors is larger than a second threshold.

26. (Previously amended) A computer readable medium storing executable computer program instructions which, when executed by a processor, cause the processor to perform a method to encode a video sequence comprising:

receiving a first video frame, a second video frame and a third video frame;

determining a first set of motion vectors between the first video frame and the second video frame and a second set of motion vectors using the third video frame; and

comparing a ratio of the first and second sets of motion vectors to a first threshold to determine whether a scene change has occurred, the occurrence of a scene change causing the first frame to be encoded as a different type of frame.

27. (Original) The computer readable medium as set forth in claim 26, wherein the first video frame comprises a first and second field;

the second video frame comprises a first and second field; and

the third video frame comprises a first and second field.

the first set of motion vectors comprises a first subset of motion vectors between the first field of the first video frame and the first field of the second video frame and a second subset of motion vectors between the second field of the first video frame and the second field of the second video frame; and

the second set of motion vectors comprises a first subset of motion vectors between the first field of the second video frame and the first field of the third video frame and a second subset of motion vectors between the second field of the second video frame and the second field of the third video frame.

28. (Original) The computer readable medium as set forth in claim 27, wherein comparing a first ratio of the first subset of the first set of motion vectors and the first subset of the second set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the first set of motion vectors and the second subset of the second set of motion vectors to the first threshold; and

determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold.

29. (Original) The computer readable medium as set forth in claim 27, wherein comparing a ratio of the first and second sets of motion vectors further comprises:

comparing a first ratio of the first subset of the first set of motion vectors and the first subset of the second set of motion vectors to the first threshold;

comparing a second ratio of the second subset of the first set of motion vectors and the second subset of the second set of motion vectors to the first threshold; and determining there is a scene change between the first video frame and second video frame if the first and second ratios are larger than the first threshold and the sum of the magnitudes of members of the first subset of the first set of motion vectors is greater than a second threshold.

30. (Previously presented) An apparatus for encoding a video sequence comprising:

means for receiving a first video frame, a second video frame and a third video frame;

means for determining a first set of motion vectors between the first video frame and the second video frame and a second set of motion vectors using the third video frame; and

means for comparing a ratio of the first and second sets of motion vectors to a first threshold to determine whether a scene change has occurred, the occurrence of a scene change causing the first frame to be encoded as a different type of frame.

31. (Previously presented) The apparatus of claim 30, wherein if a scene change is detected further comprising:

beginning a new group of pictures (GOP) at a point after the scene change.

32. (Previously presented) The apparatus of claim 30, wherein if a scene change occurs at a frame following an I-frame further comprising:

converting the I-frame to a P-frame and converting a following P-frame to an I-frame.